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# REAPPRASAL OF

# MANASQUAN RIVER ESTUARY

# 1990 - 1995

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# MANASQUAN RIVER ESTUARY

**1990-1995**

New Jersey Department of Environmental Protection
ROBERT C. SHINN, Jr.
COMMISSIONER

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## *EXECUTIVE SUMMARY*

The last sanitary survey describing this area was completed in June 1992 for the period May 1986 through February 1990. This reappraisal will include water quality data collected from January 1, 1990, through December 31, 1995. The data collected in this area showed a slight improvement in water quality. However, the improvement was not sufficient to warrant a change in classification and all classified areas will remain under the current classification.

## *INTRODUCTION*

This report is part of a series of studies having a dual purpose. The first and primary purpose is to comply with the guidelines of the National Shellfish Sanitation Program (NSSP) that are established by the Interstate Shellfish Sanitation Conference (ISSC). The second purpose is to input the State Water Quality Inventory Report which is prepared pursuant to Section 305(b) of the Federal Clean Water Act (P.L. 95-217). The information contained in the growing area reports is also used for the New Jersey State Water Quality Inventory Report (305b) which provides an assessment to Congress every two years of current water quality conditions in the State's major rivers, lakes, estuaries and ocean waters. The reports provide valuable information for the 305(b) report, which describes the waters which are attaining state designated water uses and national clean water goals; the pollution problems identified in surface waters; and the actual or potential sources of pollution.

Similarly, the reports utilize relevant information contained in the 305(b) report, since the latter assessments are based on instream monitoring data (temperature, oxygen, pH, total and fecal coliform bacteria, nutrients, solids, ammonia and metals), land-use profiles, drainage basin characteristics and other pollution source information.

From the perspective of the Shellfish Classification Program, the reciprocal use of water quality information from reports represent two sides of the same coin: the growing area report focuses on the estuary itself, while the 305(b) report describes the watershed that drains to that estuary.

As a brief history, the NSSP developed from public health principles and program controls formulated at the original conference on shellfish sanitation called by the Surgeon General of the United States Public Health Service in 1925. This conference was called after oysters were implicated in causing over 1500 cases of typhoid fever and 150 deaths in 1924. The tripartite cooperative program (federal, state and shellfish industry) has updated the program procedures and guidelines through workshops held periodically until 1977. Because of concern by many states that the NSSP guidelines were not being enforced uniformly, a delegation of state shellfish officials from 22 states met in 1982 in Annapolis, Maryland, and formed the ISSC. The first annual meeting was held in 1983 and continues to meet annually at various locations throughout the United States.

Parts I and II of the NSSP Manual set forth the principles and requirements for the sanitary control of shellfish produced and shipped in interstate commerce in the United States. They provide basis used by the Federal Food and Drug Administration (FDA) in evaluating state shellfish sanitation programs. There are five major points on which the state is evaluated by the FDA include:

1. The classification of all actual and potential shellfish growing areas as to their suitability for shellfish harvesting.
2. The control of the harvesting of shellfish from areas which are classified as restricted, prohibited or otherwise closed.
3. The regulation and supervision of shellfish resource recovery programs.
4. The ability to restrict the harvest of shellfish from areas in a public health emergency, and
5. Prevent the sale, shipment or possession of shellfish which cannot be identified as being produced in accordance with the NSSP and have the ability to condemn, seize or embargo such shellfish.

The authority to carry out these functions is divided between the Department of Environmental Protection (DEP), the Department of Health and the Department of Law and Public Safety. The Bureau of Marine Water Classification and Analysis (BMWCA) under the authority of N.J.S.A. 58:24 classifies the shellfish growing waters and administers the special resource recovery programs. Regulations delineating the growing areas are promulgated at N.J.A.C. 7:12 and are revised annually. Special Permit rules are also found at N.J.A.C. 7:12 and are revised as necessary.

The Bureau of Shellfisheries in the Division of Fish, Game and Wildlife issues harvesting licenses and leases for shellfish grounds under the Authority of N.J.S.A. 50:2 and N.J.A.C. 7:25. This bureau in conjunction with the BMWCA administers the Hard Clam Relay Program.

The Bureau of Law Enforcement in the DEP and the Division of State Police in the Department of Law and Public Safety enforce the provisions of the statutes and rules mentioned above.

The Department of Health is responsible for the certification of wholesale shellfish establishments and in conjunction with the BMWCA, administers the depuration program. (See Appendix for organization chart).

Emphasis is placed on the sanitary control of shellfish because of the direct relationship between pollution of shellfish growing areas and the transmission of diseases to humans. Shellfish borne infectious diseases are generally transmitted via a fecal-oral route. The pathway is complex and quite circuitous. The cycle usually begins with fecal contamination of the shellfish growing waters. Sources of such contamination are many and varied. Contamination reaches the waterways via runoff and direct discharges.

Clams, oysters and mussels pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish also concentrate microorganisms, which may include pathogenic microbes, and toxic heavy metals/chemicals. It is imperative that a system is in place to reduce the human health risk of consuming shellfish from areas of contamination.

Accurate classifications of shellfish growing areas are completed through a comprehensive sanitary survey. The principal components of the sanitary survey report include:

1. An evaluation of all actual and potential sources of pollution,
2. An evaluation of the hydrography of the area and
3. An assessment of water quality. Complete intensive sanitary surveys are conducted every 12 years with interim narrative evaluations completed on a three year basis. If major changes to the shoreline or bacterial quality occur, then the intensive report is initiated prior to its l2 year schedule.

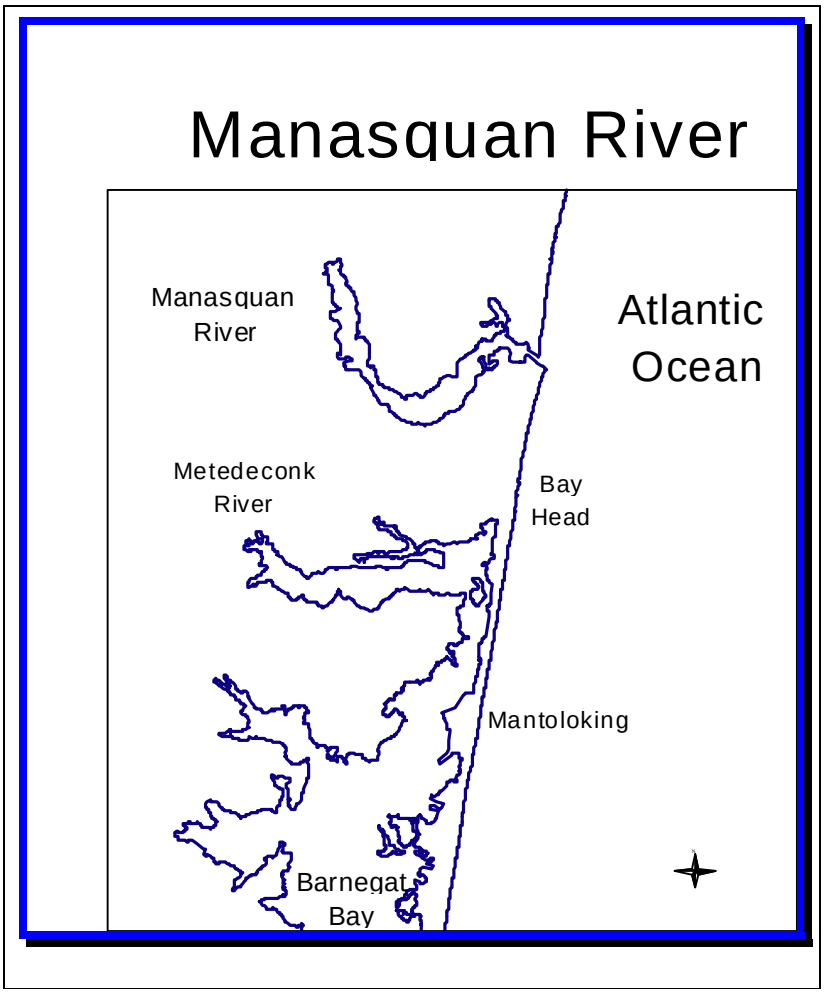
The following narrative constitutes this bureau's assessment of the above mentioned components and determines the current classification of the shellfish growing waters.

## *DESCRIPTION*

The Manasquan River is located on the border between Ocean and Monmouth Counties, as shown in Figure 1 and on Chart 3 of the Shellfish Growing Water Classification Chart. The Manasquan River estuary is hydrologically connected to the Atlantic Ocean through the Manasquan Inlet and to Barnegat Bay through the Point Pleasant Canal. The Manasquan Inlet is the northernmost entry point to the Intracoastal Waterway. The estuary has a semi-diurnal tidal exchange with the Atlantic Ocean.

The estuary is bordered by a resort area used extensively for recreation, especially during the summer months. Two large bathing beaches are located on the northern and southern margins of the estuary at the Manasquan Inlet. An additional bathing beach is located upstream of the Point Pleasant Canal. Numerous marinas and waterfront restaurants are located in the boroughs of Manasquan, Brielle, Point Pleasant, and Point Pleasant Beach. In addition, Point Pleasant Beach is home to a large commercial fishing fleet. Much of the estuary is lined with bulkheads.

The Manasquan River Wildlife Refuge is located upstream of the Route 70 bridge, providing habitat for a variety of migratory birds as well as potential nursery areas for fish. Gull Island, located between the New Jersey Transit railroad bridge and the outlet from Lake Louise, has been set aside as a Conservation Area.




The Manasquan Estuary was closed to shellfishing in 1961. After the depuration program was initiated in 1983, a special study was conducted during the summers of 1985 through 1987 to determine if portions of the estuary could be opened as *Special Restricted* waters. In 1987 the estuary was upgraded to Special Restricted waters. In 1990 the portion of the Manasquan estuary upstream of the Route 70 bridge was classified as *Prohibited*, while the remainder of the estuary from the Manasquan Inlet to the Route 70 Bridge was classified as *Special Restricted*.

**Figure 1: Location of Manasquan River Estuary**

Shellfish may be harvested from waters classified as *Special Restricted* if the shellfish are subsequently treated either through the depuration or relay programs.

Shellfish may not be harvested from waters classified as *Prohibited*. The last sanitary survey and assessment of water quality was published in June 1992 and covered the period from May 1986 through February 1990. The current classification of the Manasquan River estuary is shown in Figure 2.

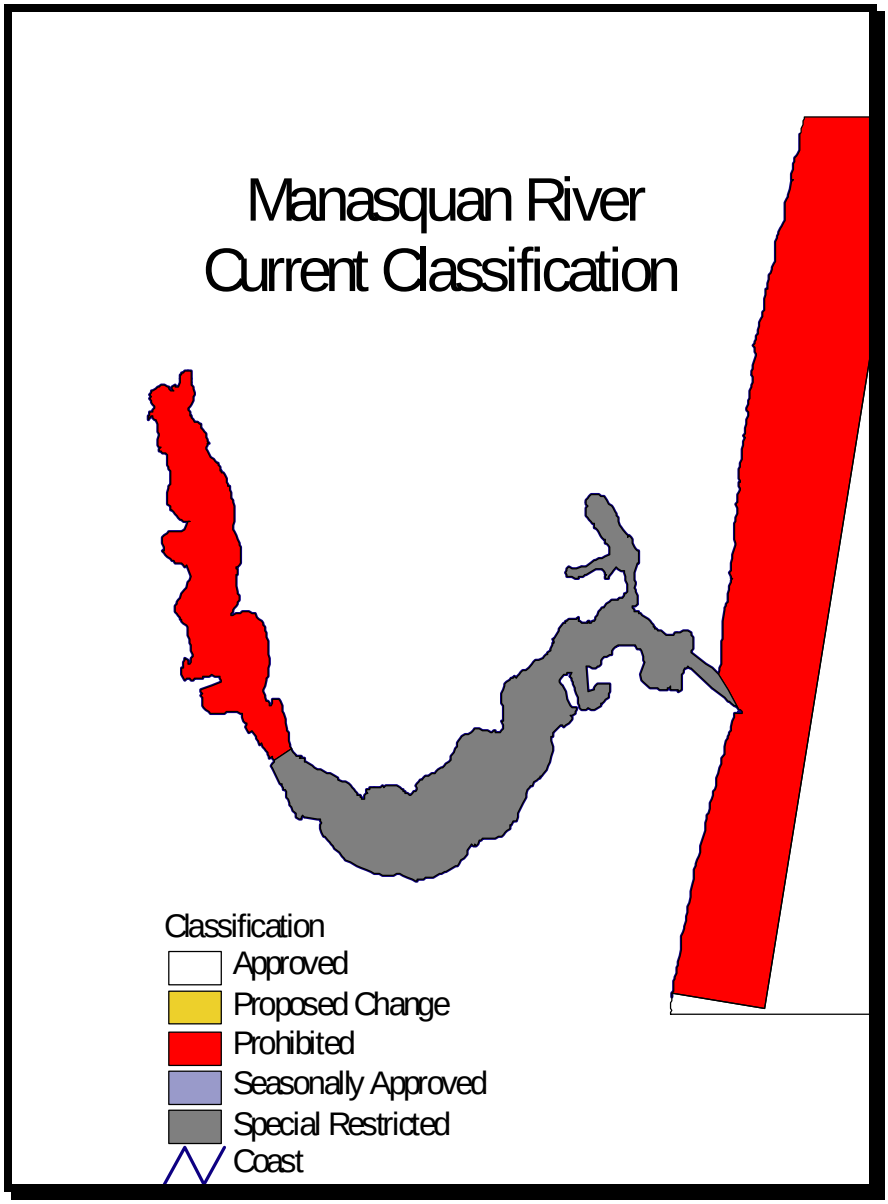



**Figure 2: Current Classification of Shellfish Waters in the Manasquan River Estuary.** Note that the waters upstream of the Route 70 bridge are classified as Prohibited. The remainder of the estuary is classified as Special Restricted.

In 1993, partially in response to the 1992 sanitary survey, the Monmouth/Ocean Alliance to Enhance the Manasquan River, which includes representatives of Monmouth and Ocean Counties, the marine trades, the US Coast Guard, the New Jersey Marine Sciences Consortium, the NJDEP, and other concerned parties, was formed in an effort to provide increased recreational, esthetic, and economic benefits from activities associated with the estuary.

The Alliance submitted a proposal to the NJDEP in 1996 requesting that the Manasquan River be established as a federally designated No Discharge Area. Such a designation would decrease the discharge of sewage from boats and thereby improve the water quality in the river. Funding from the Clean Vessel Act would provide for the necessary pump-out facilities.

According to the proposal filed by the Alliance, the Manasquan inlet is one of the busiest inlets on the eastern seaboard, with more than 1,500 vessels passing through the inlet in a 10 hour period. Approximately 2,500 vessels are harbored within the estuary. Most of these vessels are used for commercial or recreational fishing. The Manasquan River Estuary contains approximately 1,500 acres of shellfish beds, of which approximately 400 acres is currently classified as Prohibited. The resource is primarily hard clams (Mercenaria mercenaria), with a potential estimated dock-side value of $1.2 million.

## *METHODS*

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 1987).

Approximately 1000 water samples were collected for total and fecal coliform bacteria between 1990 and 1995 and analyzed by the three tube MPN method according to APHA (1970). Figure 3 shows the Shellfish Growing Water Quality monitoring stations in the Manasquan River. Approximately 41 stations are monitored during each year.

Water quality sampling, shoreline and watershed surveys were conducted in accordance with the NSSP Manual of Operations, Part I, Appendix B (USPHS, 1992). Analysis of samples was conducted under the current year Department of Environmental Protection QA/QC plan.

Data management and analysis was accomplished through Storet. Mapping of pollution data was performed with the NJDEP, Geographic and Statistical Analysis Unit, Geographic Information System (GIS:ARCVIEW).

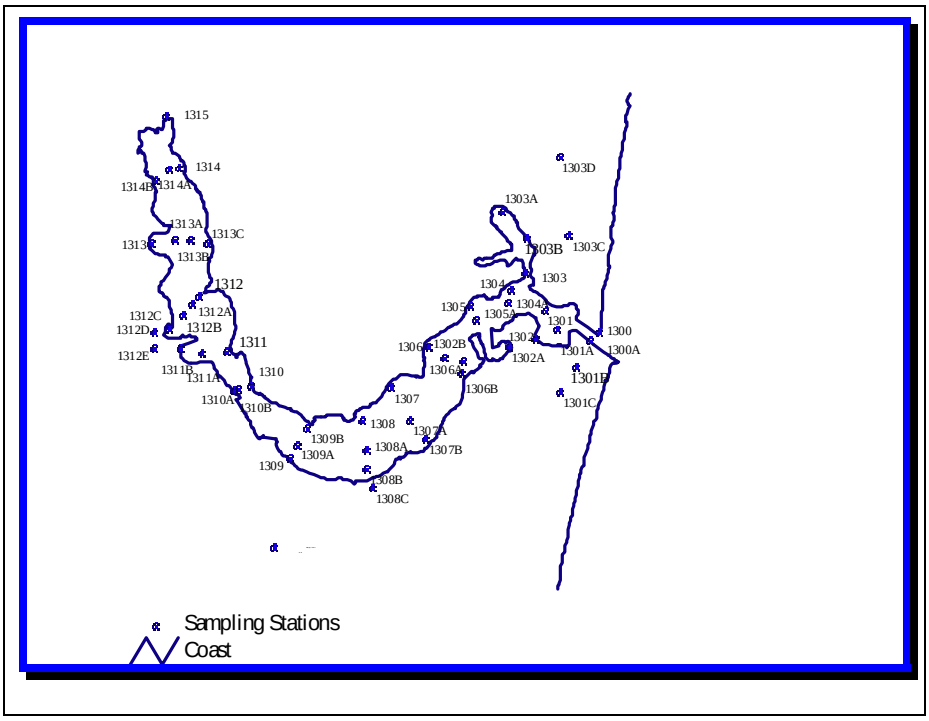



**Figure 3: Location of Sampling Stations in the Manasquan River Estuary**

## BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS

The water quality of each growing area must be evaluated before an area can be classified as *Approved, Seasonally Approved, Special Restricted,* or *Seasonal Special Restricted*. Criteria for bacterial acceptability of shellfish growing waters are provided in Part I of National Shellfish Sanitation Program Manual of Operations - 1992 Revision. Each shellfish producing state is directed to adopt either the total coliform criterion, or the fecal coliform criterion. While New Jersey bases its growing water classifications on the total coliform criterion, it does make corresponding fecal coliform determinations for each sampling station, these data are viewed as adjunct information and are not directly used for classification. The State Shellfish Control Authority also has the option of choosing one of the two water monitoring sampling strategies for each growing area.

The Adverse Pollution Condition Strategy requires that a minimum of five samples be collected each year under conditions that have historically resulted in elevated coliforms in the particular growing area. The results must be evaluated by adding the individual station sample results to the preexisting bacteriological sampling results to constitute a data set of at least 15 samples for each station. The adverse pollution conditions usually are related to tide, and rainfall, but could be from a point source of pollution or variation could occur during a specific time of the year. Under this strategy, for *Approved* waters, the total

coliform median or geometric mean MPN of the water shall not exceed 70 per 100 mL and not more than 10 percent of the samples exceed an MPN of 330 per 100 mL for the 3-tube decimal dilution test. For *Special Restricted* waters, the total coliform median or geometric mean MPN of the water shall not exceed 700 per 100 mL and not more than 10 percent of the samples exceed an MPN of 3300 per 100 mL for the 3-tube decimal dilution test. Areas to be Approved under the Seasonal classification must be sampled and meet the criterion during the time of the year that it is approved for the harvest of shellfish.

The Systematic Random Sampling strategy requires that a random sampling plan be in place before field sampling begins and can only be used in areas that are not affected by point sources of contamination. A minimum of six samples per station are to be collected each year and added to database to obtain a sample size of 30 for statistical analysis. The bacteriological quality of every sampling station in *Approved* areas shall have a total coliform median or geometric mean MPN not exceeding 70 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 330 per 100 mL. For *Special Restricted* areas, the bacteriological quality shall not exceed a total coliform median or geometric mean MPN of 700 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 3,300 per 100 mL.

The Manasquan River is sampled under the Adverse Pollution Condition strategy described above. The adverse condition is rainfall.

## *SHORELINE SURVEY*

The Manasquan River is more than 23 miles in length and drains a total area of 81 square miles. The lower 6.5 miles comprise the estuary. The drainage area includes extensive urban/suburban development, as well as forested and agricultural areas, as shown in Figure 4. Much of the area immediately adjacent to the estuary is urban / suburban, with agricultural and forested areas located upstream and/or further from the estuary. This reflects the extensive recreational uses of the area, particularly during the summer.

The estuary is bordered by Wall Township, Brielle Borough, and Manasquan Borough to the north and by Brick Township, Point Pleasant Borough, and Point Pleasant Beach Borough to the south.

The extensive recreational uses in the Manasquan Estuary have resulted in numerous marinas and yacht clubs to service the transient tourist population. According to a 1995 survey conducted by the Monmouth and Ocean County Health Departments, 26 marinas or yacht clubs service approximately 1,940 vessels. Most of the vessels are used for recreational fishing and are greater than 16 feet in length. In addition there are transient vessels entering or leaving the Intracoastal Waterway which use the marina services.

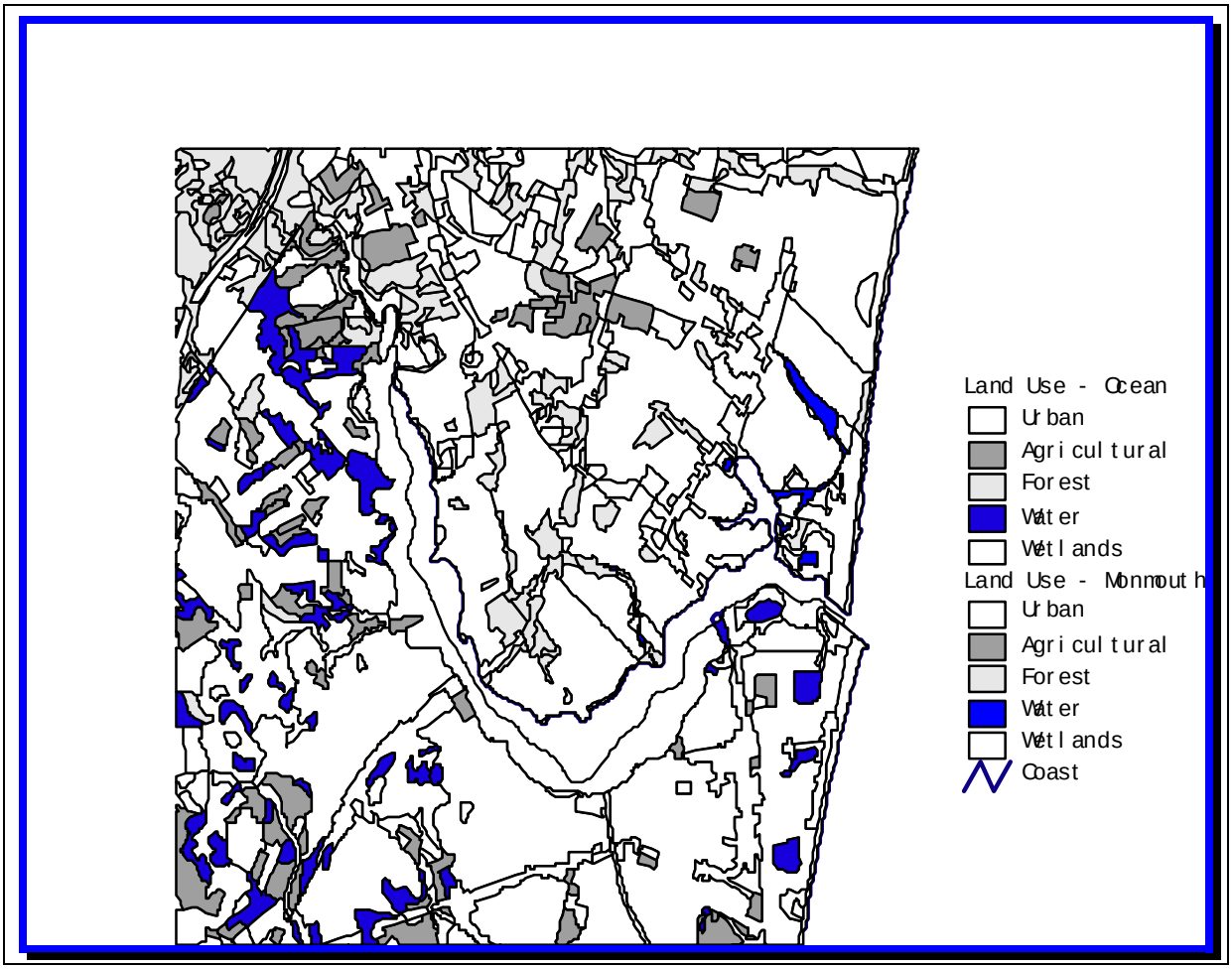



**Figure 4: Land Use Patterns Adjacent to the Manasquan River Estuary**

Figure 5 shows the locations of some of the larger marinas and boat basins. The facilities tend to be concentrated in two distinct areas which have easy vehicular accessibility: between the approximate location of the Route 35 bridge to the inlet and in the vicinity of the Route 70 bridge. Shellfish harvesting is prohibited in the immediate vicinity of marinas.

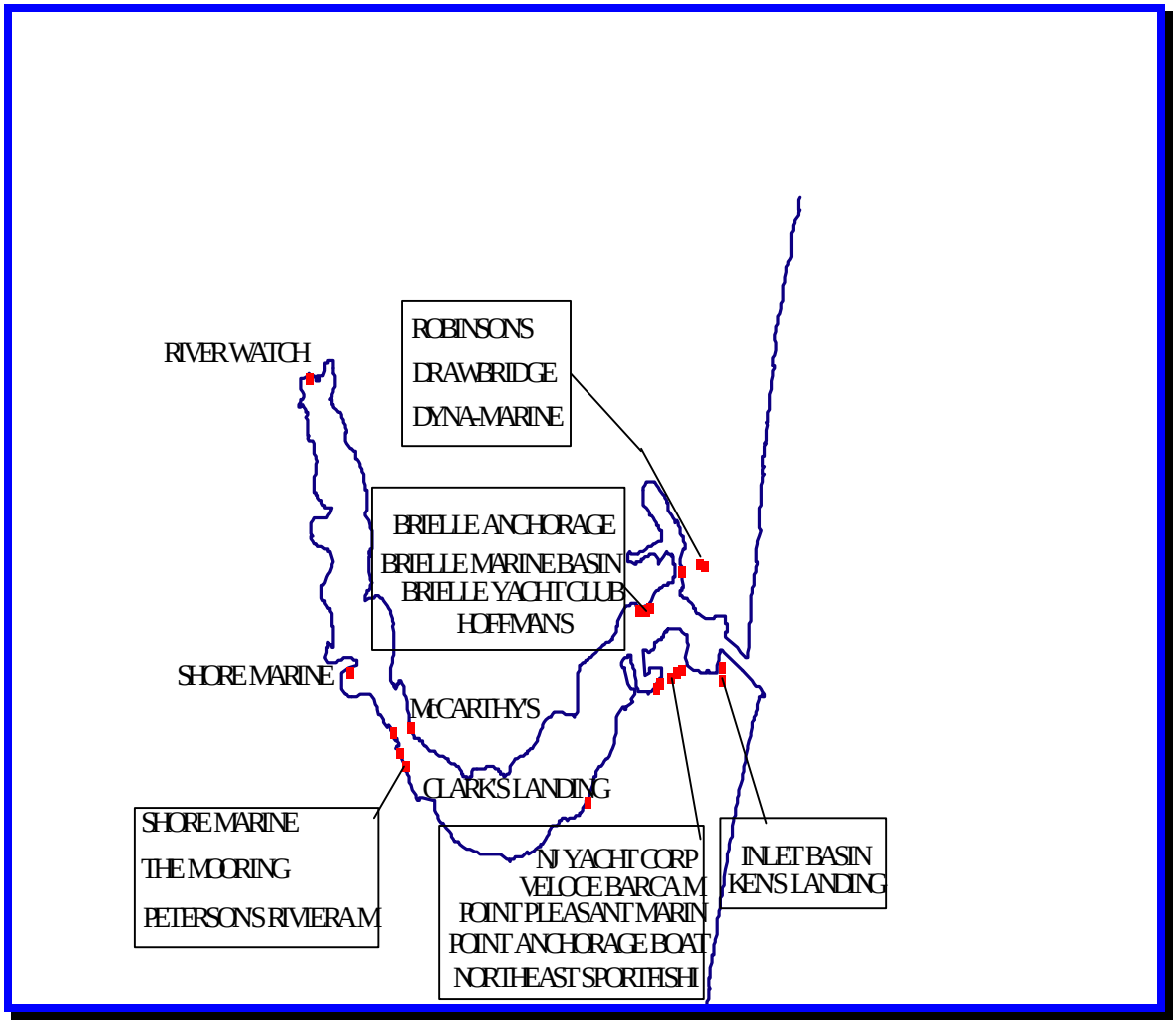



**Figure 5: Representative Marinas Located in Manasquan Estuary**

There are no direct discharges of treated effluent to the Manasquan Estuary. However, there are numerous stormwater discharges and identified contaminated sites which could potentially affect water quality in the estuary. Figure 6 demonstrates the locations of stormwater outfalls and contaminated sites in the vicinity of the estuary.

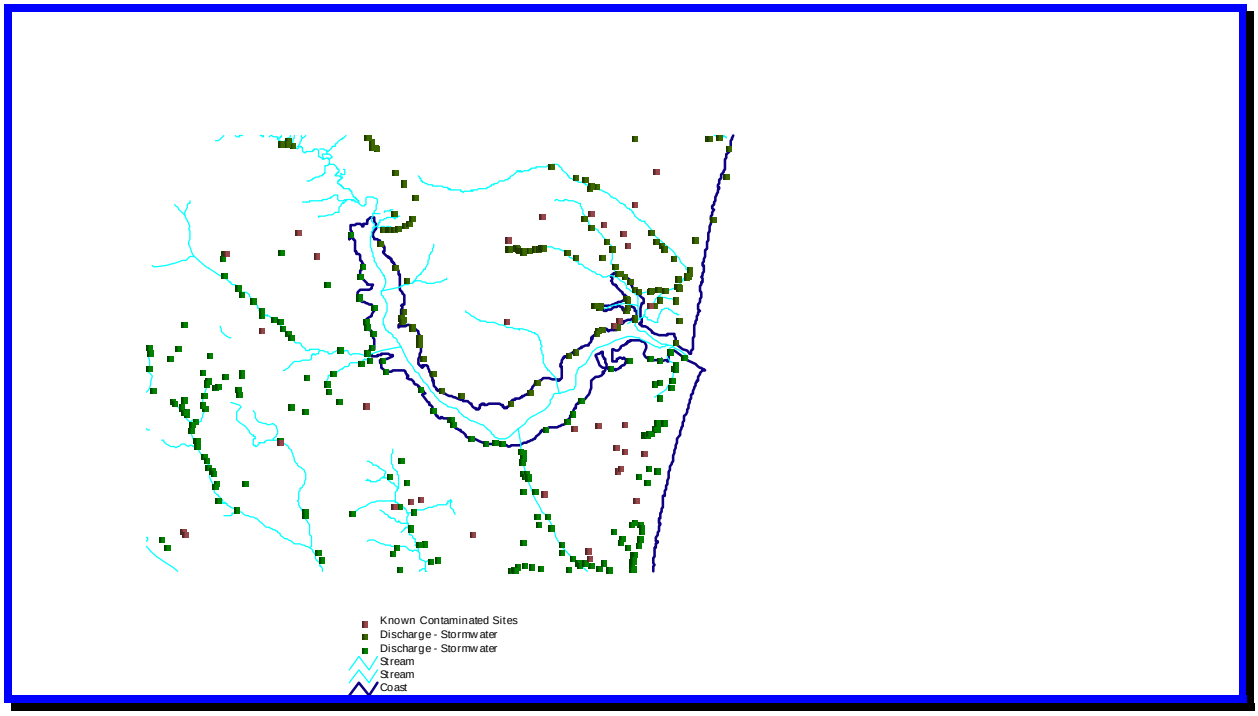



**Figure 6: Potential Pollutant Sources in the Manasquan Estuary**

## *IDENTIFICATION AND EVALUATION OF SOURCES*

The primary potential sources of pollutants to the Manasquan Estuary include: nonpoint sources such as those discharging into stormwater sewers, discharges associated with marinas, and agricultural inputs from upstream areas. There is also a significant migratory bird population during certain times of the year at the Manasquan River Wildlife Refuge, which is located just upstream of the estuary. None of these sources has changed significantly since the last sanitary survey in 1992.

However, the Monmouth Ocean Alliance to Enhance the Manasquan River has been active in advocating establishing a No Discharge Zone for the Manasquan Estuary. Such a zone would result in decreased inputs from vessels using the Estuary for dockage or in transit. Communities adjacent to the estuary have also been effective in encouraging reductions in pollutants discharged to storm sewers through public education efforts.

## *HYDROGRAPHY*

A hydrography report was included in the Sanitary Survey completed in 1992 and included data for the period 1986 to 1990. The Manasquan River Reservoir was completed in 1990. The reservoir, which provides a drinking water supply for southern Monmouth and northern Ocean counties, is filled through a combination of rainfall, flowthrough from

small feeder tributaries to the Manasquan River, and a pumping station located upstream of the USGS gauging station at Hospital Road. Discharge was measured at the USGS gauging station prior to filling the reservoir, during the time the reservoir was filling, and subsequent to its completion. Based on these data, construction of the reservoir has had little overall effect on the discharge of fresh water from the drainage basin to the estuary.

The inlet and the channel associated with the Intracoastal Waterway are periodically dredged to maintain the appropriate channel depth. There have been no additional significant changes in hydrography since 1990.

## *WATER QUALITY*

A summary of water quality data collected from 1990 through 1995 is presented in Table 1. These data were used to determine the appropriate shellfish harvesting classification for the Manasquan River Estuary.

**Table 1: Summary of Water Quality Data for the Manasquan River Estuary (1990-1995).** Blue shaded data is not in compliance with the *Approved* standard. Pink shaded data is not in compliance with the *Special Restricted* standard.

| Station | Total Coliform Median | Total Coliform percent >330 | Fecal Coliform Median | Fecal Coliform percent >49 |
|---|---|---|---|---|
| 1300 | 7.3 | 3.7 | 3.6 | 14.8 |
| 1301A | 93 | 14.8 | 23 | 18.5 |
| 1301B | 93 | 29.6 | 43 | 37 |
| 1302A | 28 | 7.4 | 15 | 22.2 |
| 1302B | 43 | 3.7 | 23 | 18.5 |
| 1303 | 43 | 7.4 | 20 | 22.2 |
| 1303A | 75 | 18.5 | 23 | 22.2 |
| 1303C | 93 | 14.8 | 21 | 33.3 |
| 1304A | 23 | 7.4 | 9.1 | 7.4 |
| 1305A | 9.1 | 3.7 | 3.6 | 7.4 |
| 1306 | 23 | 3.7 | 7.3 | 11.1 |
| 1306A | 20 | 3.7 | 9.1 | 7.4 |
| 1306B | 23 | 7.4 | 23 | 7.4 |

**Table 1 (continued)**

| Station | Total Coliform Median | Total Coliform percent >330 | Fecal Coliform Median | Fecal Coliform percent >49 |
|---|---|---|---|---|
| 1307 | 23 | 14.8 | 9.1 | 7.4 |
| 1307A | 43 | 7.4 | 15 | 14.8 |
| 1307B | 43 | 7.4 | 23 | 18.5 |
| 1308 | 23 | 3.7 | 15 | 11.1 |
| 1308B | 35.5 | 7.7 | 12.1 | 15.4 |
| 1308C | 43 | 7.4 | 23 | 22.2 |
| 1309 | 43 | 14.8 | 23 | 18.5 |
| 1309A | 43 | 7.4 | 23 | 22.2 |
| 1310A | 93 | 18.5 | 23 | 33.3 |
| 1310B | 121.5 | 34.6 | 36 | 42.3 |
| 1311 | 93 | 29.6 | 23 | 29.6 |
| 1312A | 161.5 | 38.5 | 43 | 38.5 |
| 1313A | 460 | 53.8 | 93 | 65.4 |
| 1314A | 460 | 61.5 | 121.5 | 61.5 |

Note that upstream of transect 1310, located at the Route 70 bridge, the ambient water quality becomes significantly degraded. The area upstream of the Route 70 bridge is classified as *Prohibited*.

Figure 7 provides a graphical representation of the total coliform geometric mean values which correspond to the sampling locations from the inlet to the upper end of the estuary. The total coliform concentration at sampling locations in the Manasquan consistently exceeds the standard of 70 colonies/100 mL for approved waters, while the upper reach, upstream of the Route 70 bridge, frequently exceeds the special restricted standard.

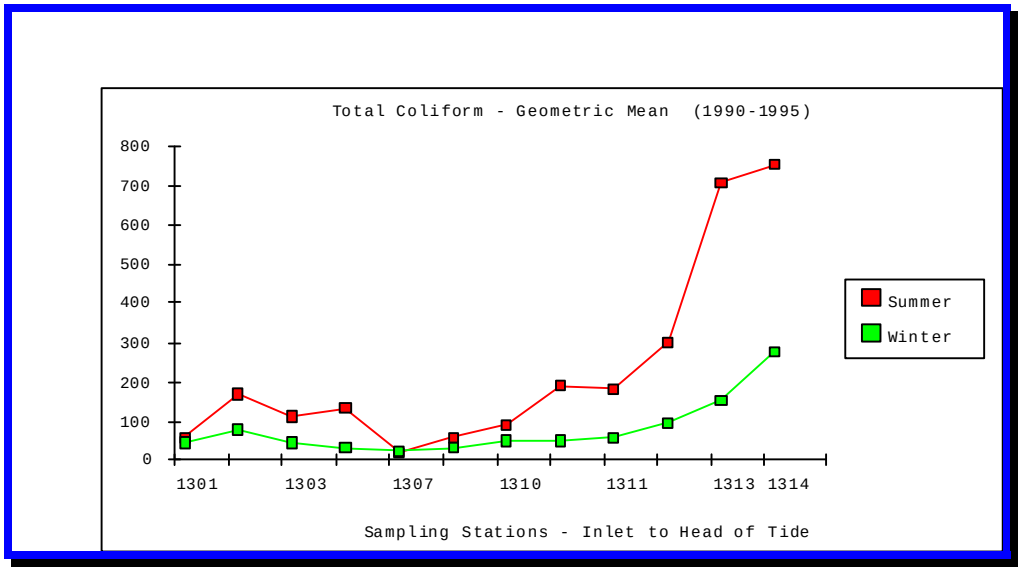



**Figure 7: Total Coliform Geometric Mean Values (1990-1995).** The standard is frequently exceeded throughout the estuary, with the worst water quality in the area upstream of the Route 70 bridge.

Figures 8, 9, 10, and 11 provide a graphical representation of the total and fecal coliform values (medians and percentages). The X-axis is organized by monitoring site location, from the downstream stations (1300 series) to the upstream stations (1314 series).

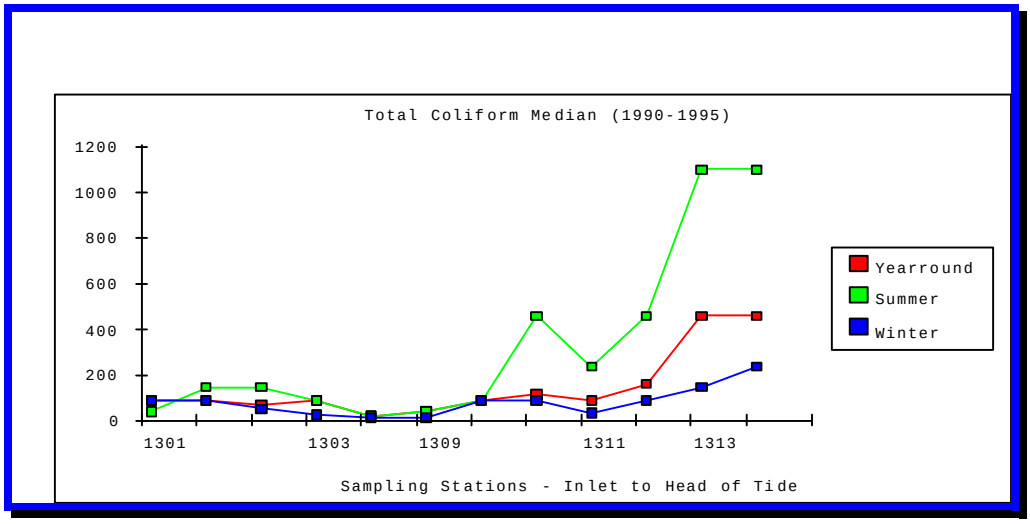



**Figure 8: Total Coliform Median Values (1990-1995).** The standard is frequently exceeded throughout the estuary, with the worst water quality in the area upstream of the Route 70 bridge.

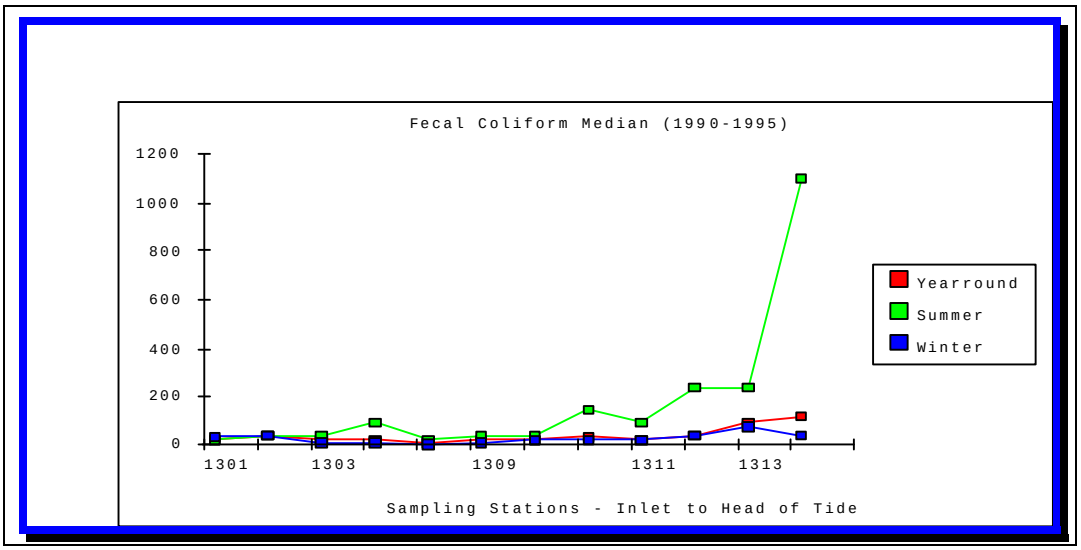



**Figure 9: Fecal Coliform Median Values (1990-1995).** The standard is frequently exceeded throughout the estuary, with the worst water quality in the area upstream of the Route 70 bridge.

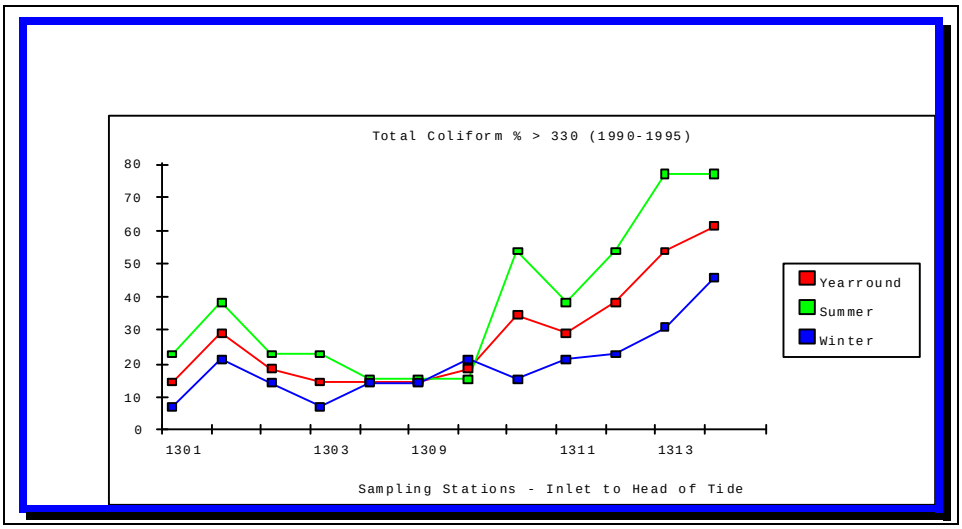



**Figure 10: Total Coliform Percentage Greater than 330 col/100mL (1990-1995).**
The standard is frequently exceeded throughout the estuary, with the worst water quality in the area upstream of the Route 70 bridge.

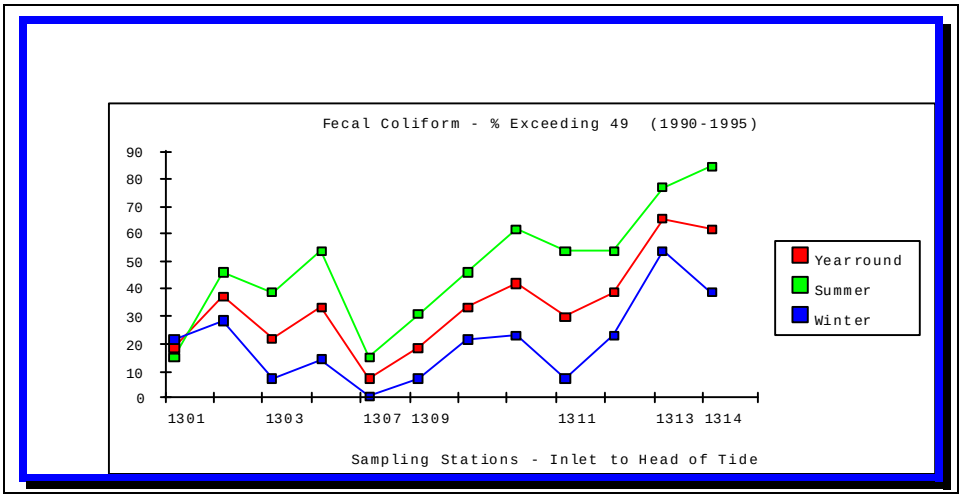



**Figure 11: Fecal Coliform Percentage Greater Than 49 col/100mL (1990-1995**).
The standard is frequently exceeded throughout the estuary, with the worst water quality in the area upstream of the Route 70 bridge.

## *INTERPETATION AND DISCUSSION OF DATA*

The stations upstream of the Route 70 bridge (1310-1314A),exhibit the worst water quality. This upstream segment (400 acres) of the Manasquan River has the highest coliform levels and sometimes exceeds the standards for *Special Restricted* waters. In 1987, administrative changes in New Jersey's shellfish program resulted in the estuary being reclassified from *Prohibited* to *Special Restricted*, although water quality had not changed (Scro, 1990). The upstream area was subsequently reclassified as *Prohibited* waters in 1990.

Stations 1300-1307B meet the standards for *Special Restricted* waters. In addition, many of the station nearly meet the standards for *Approved* waters, particularly during the winter months. Continued improvement in water quality may eventually result in upgrading some or all of the estuary.

Marine waters are sampled regularly for marine biotoxins by personnel from the Bureau of Water Monitoring. The data are summarized in annual reports published by the Department. In the event of elevated levels, additional samples are obtained for verification. The BMWCA laboratory maintains certification to provide the marine bioassay procedure for paralytic shellfish poison.

Statistical analysis (t-test) of shellfish growing water quality data, from 1990 through 1995, indicates that tide does not have a statistically significant influence on coliform values in the Manasquan River.

Correlation analysis of shellfish growing water quality data shows a weak relationship between rainfall and elevated total coliform concentrations. However, since this area was previously not sampled under a rainfall priority, there are insufficient data to demonstrate that rainfall is an important consideration.

The analysis of total coliform indicates that summer season has the greatest adverse impact on the water quality of the Manasquan River. The worst water quality (i.e., those stations exceeding th*e Special Restricted* water criteria) was exhibited during the summer in the upper segment of the Manasquan River. During the winter, the lower segments of the river, east of the Route 70 bridge, frequently meet the median concentration for *Approved* shellfish water quality criteria between November and April, but only sporadically meet the percentage standard.

## *CONCLUSIONS*

The data collected during the period 1990 through 1995 support the current shellfish classifications of the Manasquan River Estuary and no changes in classification will be proposed at this time. The area upstream of the Route 70 bridge will continue to be classified as *Prohibited*. The area between the Route 70 bridge and the Inlet, except for the Point Pleasant Canal and the immediate vicinity of marinas will continue to be classified as *Special Restricted*.

The Monmouth Ocean Alliance is encouraged to continue in the effort to designate the estuary as a No Discharge Zone. In addition, full implementation of Best Management Practices to reduce discharges from nonpoint sources of pollutants would affect the estuary in a positive manner.

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# *APPENDICES*

A. Statistical Summaries

- Yearround
- Winter Only
- Summer Only

B. Seasonal Evaluation

C. Precipitation

- Rainfall Correlation
- Cumulative Rainfall
- Wet Weather Statistical Summary
- Dry Weather Statistical Summary

D. Tidal Evaluation

E. Data Listing - 1990 through 1995

F. Organization Chart